

**REMARKS/ARGUMENTS**

With this amendment, claims 15, 16, 26, and 27 are pending. Claims 6-14 and 17-21 are cancelled without prejudice to subsequent revival. For convenience, the Examiner's rejections are addressed in the order presented in a January 9, 2004 Office Action.

**I. Status of the claims**

Claim 15 is amended to recite that the antibody composition comprises an antibody that is specifically binds to a CD97 EGF-like repeat selected from the group consisting of SEQ ID NO:3 and SEQ ID NO:4. Support for antibodies specifically reactive to SEQ ID NO:3 or SEQ ID NO:4 is found throughout the specification, for example at page 23, lines 25-28. Claim 15 is also amended to define EGF as epidermal growth factor. These amendments add no new matter.

Claim 16 is amended to recite that the antibody composition comprises at least three different antibodies that bind to different soluble CD97  $\alpha$  subunit epitopes. Support for this amendment is found throughout the specification, for example, at page 20, lines 8-11, and at original claim 16. This amendment adds no new matter.

New claim 26 depends from claim 15 and is directed to an antibody composition that comprises an antibody that is specifically reactive to the CD97 EGF-like repeat of SEQ ID NO:3. New claim 27 also depends from claim 15 and is directed to an antibody composition that comprises an antibody that is specifically reactive to the CD97 EGF-like repeat of SEQ ID NO:4. Support for the new claims is found throughout the specification, for example at page 23, lines 25-28.

New claim 28 is added and recites that the  $\alpha$ 1 subunit has an EGF-like repeat selected from SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, SEQ ID NO:4, and SEQ ID NO:5. Support for the composition of the  $\alpha$ 1 subunit is found throughout the specification, for example at page 22, lines 26-27. New claim 29 is added and that the  $\alpha$ 2 subunit has an EGF-like repeat selected from SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, and SEQ ID NO:5. Support for the

composition of the  $\alpha 2$  subunit is found throughout the specification, for example at page 23, lines 2-3.

Claims 6-14 and 17-21 are cancelled without prejudice to subsequent revival.

## **II. Objections to the abstract**

The specification is objected to because the abstract allegedly does not contain a concise statement of the technical disclosure of the patent. In order to expedite prosecution the abstract is amended to recite an antibody composition.

## **III. Rejections under 35 U.S.C. §112, first paragraph, enablement**

Claims 15 and 16 are rejected under 35 U.S.C. §112, first paragraph as allegedly failing to enable one of skill to practice the claimed invention. The claims are now directed to an antibody composition that specifically binds to a soluble CD97  $\alpha$  subunit, *i.e.*,  $\alpha 1$  or  $\alpha 2$ , and that include an antibody that specifically binds to a CD97 EGF-like repeat selected from SEQ ID NO:3 or SEQ ID NO:4. To the extent the rejection applies to the amended claims, Applicants respectfully traverse.

The appropriate test of enablement is “whether one skilled in the art could make or use the claimed invention from the disclosure in the patent coupled with information known in the art without undue experimentation” (*see, e.g.*, MPEP §2164.01). As described below, the specification as written provides ample direction in the form of assays and working examples to identify antibody compositions comprising antibodies that specifically bind to a CD97 EGF-like repeat selected from SEQ ID NO:3 or SEQ ID NO:4.

The specification teaches how to make antibodies that bind to specific sequences and their identification, *e.g.*, immunoassays. *See, e.g.*, specification at pages 36-47. The specification also teaches antibodies that specifically bind to CD97  $\alpha$  subunits at page 23, line 31 through page 24, line 2. Proteins and epitopes specifically identified as appropriate for antibody production in the specification include a CD97  $\alpha$  subunit. A CD97  $\alpha$  subunit is a CD97 sequence that is N-terminal to an RGD motif. The sequence N-terminal to the RGD motif of CD97 is identified in Figure 1. The  $\alpha 1$  subunit is taught to comprise EGF-like repeats of SEQ ID NOs:1,

2, 3, 4, and 5 at page 22, lines 26-31. The  $\alpha 2$  subunit is taught to comprise EGF-like repeats of SEQ ID NOs:1, 2, 3, and 5 at page 22, lines 26-31. Antibodies against individual EGF-like repeats of SEQ ID NOs:1, 2, 3, 4, and 5 are taught *e.g.*, at page 23, lines 25-28. In addition, an example of an antibody that binds to SEQ ID NO:3 is found, *e.g.*, at Example 3, page 75. Applicants note that SEQ ID NO:15 is a subsequence of SEQ ID NO:3 and that an antibody that recognizes SEQ ID NO:15 would recognize SEQ ID NO:3.

As amended, claim 16 depends from claim 15 and is directed to an antibody composition that comprises at least three different antibodies that bind to different soluble CD97  $\alpha$  subunit epitopes. As described above, the specification teaches how to make antibodies against individual EGF-like repeats of SEQ ID NOs:1, 2, 3, 4, and 5. The Office Action concurs that antibodies that bind to SEQ ID NOs:1, 2, and 5 are enabled. See, *e.g.*, Office Action at page 3. The specification also enables one of skill to make antibodies that bind to SEQ ID NO:3 or SEQ ID NO:4. Thus, claim 16 is enabled for an antibody composition that comprises at least three different antibodies that bind to different soluble CD97  $\alpha$  subunit epitopes, *e.g.*, SEQ ID NO:3 and/or SEQ ID NO:4 in combination with SEQ ID NOs:1, 3, or 5.

Based on the teachings of the specification the claims are enabled as required by 35 U.S.C §112, first paragraph. In view of the above amendments and remarks, withdrawal of the rejection is respectfully requested.

#### **IV. Rejections under 35 U.S.C. §112, second paragraph**

Claims 15 and 16 are rejected under 35 U.S.C. §112, second paragraph for alleged indefiniteness. To the extent the rejections apply to the amended claims, Applicants respectfully traverse and assert that one of ordinary skill in the art would understand the claimed invention in light of the specification. “[35 U.S.C.] §112, second paragraph, requires a determination of whether those skilled in the art would understand what is claimed in light of the specification.” *Orthokinetics v. Safety Travel Chairs Inc.*, 1 USPQ2d 1081 (Fed. Cir. 1986). Moreover, Applicants properly provided their own definitions of phrases objected to by the Office Action and those definitions clarify the claims. “[...] patentee can be his own lexicographer provided the patentee’s definition, to the extent it differs from the conventional definition, is clearly set

forth in the specification.” *Beachcombers v. Wildwood Creative Products, Inc.* 31 F.3d 1154, 1158 (Fed. Cir. 1994).

Specifically, claim 15 is rejected for use of the phrase "specifically reactive, under immunologically reactive conditions". Claim 15 is now amended to recite "specific binding", which is defined in the specification at page 18, line 25 through page 19, line 4.

Claim 15 is also rejected for use of the phrase "EGF-like". An "EGF-like repeat, is defined at page 11, lines 23-24 of the specification and "includes reference to at least one of the sequences selected from the group consisting of SEQ ID NOs: 1 through 5." Thus, the phrase EGF-like would be understood by one of skill in the art, based on the definition given in the specification.

Claim 15 is also rejected for use of the term "EGF". Claim 15 is now amended to use the full terminology, *i.e.*, epidermal growth factor, before the first citing of EGF in the claim.

Claim 16 is rejected for use of the term "unique". The Office Action asserts that unique is superfluous and does not further clarify the claimed subject matter. In order to expedite prosecution claim 16 is amended to recite three different antibodies that bind to different soluble CD97  $\alpha$  subunit epitopes. Support for this amendment is found throughout the specification, for example at page 20, lines 8-11.

In view of the above amendments and remarks, withdrawal of the rejection is respectfully requested.

#### **V. Rejections under 35 U.S.C. §102(b)**

Claim 15 is rejected under 35 U.S.C. §102(b) as allegedly anticipated by Hamann *et al.*, *J. Immun.* 155:1942-1950 (1995), (Hamann *et al.* (A)), and accession number P48960. According to the Office Action Hamann *et al.* (A) discloses four antibodies that react with the claimed EGF-like domains of the CD97 molecule. To the extent the rejection applies to the amended claims, Applicants respectfully traverse the rejection.

To anticipate a claim, the reference must teach every element of the claim. “A claim is anticipated only if each and every element as set forth in the claim is found...in a single prior art reference.” *Verdegaal Bros. v. Union Oil of California*, 814 F.2d 628, 631, 2 USPQ2d

1051, 1053 (Fed. Cir. 1987). Thus, in order to anticipate, the cited references must contain every element of the claims at issue. The cited references do not.

The amended claims are directed to antibody compositions that bind to a soluble CD97  $\alpha$  subunit and comprise an antibody that specifically binds to a CD97 EGF-like repeat selected from SEQ ID NO:3 and SEQ ID NO:4. The largest CD97 amino acid sequence disclosed in the application has 835 amino acid residues and includes 5 EGF-like repeats, *i.e.*, SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, SEQ ID NO:4, and SEQ ID NO:5. The claimed antibody compositions specifically bind to a CD97  $\alpha$ 1 subunit or to a CD97  $\alpha$ 2 subunit. The CD97  $\alpha$ 1 subunit is disclosed to comprise SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, SEQ ID NO:4, and SEQ ID NO:5; the CD97  $\alpha$ 2 subunit is disclosed to comprise SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, and SEQ ID NO:5.

The cited references do not disclose either a CD97 EGF-like repeat of SEQ ID NO:3 or SEQ ID NO:4, and thus cannot teach antibodies that recognize those epitopes of the CD97 protein. Hamann *et al.* (A) discloses a CD97 protein with 742 amino acids and only three EGF-like repeats. See, *e.g.*, Figure 2 and caption at page 1945 of Hamann *et al.* (A). The sequence disclosed in Hamann *et al.* (A) does not disclose SEQ ID NO:3 or SEQ ID NO:4.

The Office Action also cited Accession number P48960 as allegedly anticipating the claimed invention. Applicants respectfully point out that the sequence disclosed in Accession number P48960 has been repeatedly revised since it was first deposited on June 1, 1996. The original sequence of P48960 was deposited by the authors of Hamann *et al.* (A) and discloses the same sequence as that reference. P48960 did not disclose the sequences of SEQ ID NO:3 and SEQ ID NO:4 until November 4, 1999, well after the priority date of this application, *i.e.*, October 25, 1996. As proof of this assertion, Applicants submit as Exhibit A, a revision history for P48960 and records for the accessible sequences of September 24, 1999 and November 4, 1999.

Because neither of the cited references disclose the amino acid sequence of SEQ ID NO:3 or SEQ ID NO:4, neither of the cited references can disclose antibodies that specifically bind to SEQ ID NO:3 or SEQ ID NO:4. Thus, the cited references do not disclose all the

elements of the claimed invention and are not properly cited as prior art. In view of the above amendments and remarks, withdrawal of the rejection is respectfully requested.

## **VI. Rejections under 35 U.S.C. §103(a)**

Claim 15 is rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Hamann *et al.*, *Genomics* 32:144-147 (1996), (Hamann *et al.* (B)), and Accession number P48960 in view of Campbell. According to the Office Action, Hamann *et al.* (B) and Accession number P48960 teach the sequence of CD97 disclosed in the application and Campbell teaches a strategy to generate antibodies, allegedly making the generation of the claimed CD97 antibodies *prima facie* obvious in view of the combination of the references. To the extent the rejection applies to the amended claims, Applicants respectfully traverse the rejection.

To establish a *prima facie* case of obviousness, three basic criteria must be met: (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference must teach or suggest all the claims limitations. MPEP§2143. See also *In re Rouffet*, 47 USPQ2d 1453. The court in *Rouffet* stated that "even when the level of skill in the art is high, the Board must identify specifically the principle, known to one of ordinary skill, that suggests the claimed combination." *Rouffet* at 1459.

The references cited by the Office Action do not teach or suggest all the limitations of the amended claims. As amended, the claims are directed to antibody compositions that bind to a soluble CD97  $\alpha$  subunit and comprise an antibody that specifically binds to a CD97 EGF-like repeat selected from SEQ ID NO:3 and SEQ ID NO:4. Applicants reiterate that the specification discloses the sequence of a CD97 protein with three, four, or five EGF domains and that the sequences of two of those domains, *e.g.*, SEQ ID NO:3 and SEQ ID NO:4, were not publicly available before the filing date of the earliest priority document.

None of the cited references, *i.e.*, Hamann *et al.* (B), Accession number P48960, or Campbell, teach or suggest a CD97  $\alpha$  subunit that comprises SEQ ID NO:3 or SEQ ID NO:4, and thus, cannot teach or disclose antibodies that bind to SEQ ID NO:3 or SEQ ID NO:4.

Hamann *et al.* (B) discloses the intron/exon organization of a CD97 gene that encodes three EGF like domains. See, *e.g.*, Figure 1 and caption at page 146 of Hamann *et al.* (B). The shortcomings of Accession number P48960 are discussed above and also demonstrate the failure of Accession number P48960 to provide a teaching or suggestion relevant to an obviousness rejection. Campbell discloses only techniques to make antibodies and does not teach or suggest SEQ ID NO:3 or SEQ ID NO:4 or antibodies that specifically bind to those sequences. Finally, Applicants were the first to identify soluble forms of the CD97 protein, *e.g.* the  $\alpha 1$  and  $\alpha 2$  subunits, and their role in angiogenesis and inflammatory processes. Without that knowledge and given the lack of disclosure of SEQ ID NO:3 and SEQ ID NO:4 in the cited references, the references also fail to provide a motivation for their combination to arrive at an antibody composition that comprises antibodies that specifically bind to SEQ ID NO:3 or SEQ ID NO:4.

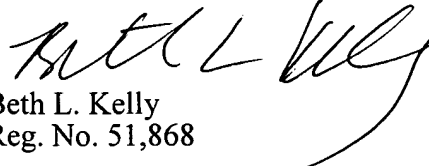
In view of the above amendments and remarks, withdrawal of the rejection under 35 U.S.C. §103(a) is requested.

### CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-576-0200.

Respectfully submitted,

  
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Attachments  
BLK:blk  
60246889 v1



PubMed

Nucleotide

Protein

Genome

Structure

PMC

Taxonomy

OMIM



## Sequence Revision History

Find (Accessions, GI numbers or Fasta style SeqIds) P48960

GI

About Entrez

Show

difference between I and II as

GenBank/GenPept

Entrez

## Revision history for P48960

## Search for Genes

LocusLink provides curated information for human, fruit fly, mouse, rat, and zebrafish

Help/FAQ

Batch Entrez: Upload a file of GI or accession numbers to retrieve protein or nucleotide sequences

Check sequence revision history

How to create WWW links to Entrez

LinkOut

Cubby

## Related resources

BLAST

Reference sequence project

LocusLink

Clusters of orthologous groups

Protein reviews on the web

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## Exhibit A



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Accession P48960 was first seen at NCBI on Jun 1 1996 2:58 AM

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Entrez

PubMed

Nucleotide

Protein

Genome

Structure

PMC

Taxonomy

Boo

Search Nucleotide for

Go

Clear

Limits

Preview/Index

History

Clipboard

Details

Display

default

Show:

20

Send to

File

Get Subsequence

Feat

☐ 1: P48960[gi:1345711] This record was replaced or removed. See [revision history](#) for details.

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 REFERENCE 1 (residues 1 to 742)  
 AUTHORS Hamann,J., Eichler,W., Hamann,D., Kerstens,H.M., Poddighe,P.J.,  
 Hoovers,J.M., Hartmann,E., Strauss,M. and van Lier,R.A.  
 TITLE Expression cloning and chromosomal mapping of the leukocyte  
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 the secretion receptor superfamily with an unusual extracellular  
 domain  
 JOURNAL J. Immunol. 155 (4), 1942-1950 (1995)  
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 AUTHORS Hamann,J., Hartmann,E. and van Lier,R.A.  
 TITLE Structure of the human CD97 gene: exon shuffling has generated a  
 new type of seven-span transmembrane molecule related to the  
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 This SWISS-PROT entry is copyright. It is produced through a  
 collaboration between the Swiss Institute of Bioinformatics and  
 the EMBL outstation - the European Bioinformatics Institute.  
 The original entry is available from <http://www.expasy.ch/sprot>

and <http://www.ebi.ac.uk/sprot>

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Region 668..673
/gene="CD97"
/region_name="Domain"
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/region_name="POTENTIAL."
Region 697..742
/gene="CD97"
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## ORIGIN

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61  tcddinecat pskvscgkfs dcwntegsyd cvcspgyepv sgaktfknes entcqdvddec
121 ssgqhqcddss tvcfntvg sy scrcrpgwkp rhgipnnqkd tvcedmtfst wtpppgvhsq
181 tlrffdkvq dlgrdsktss aevtiqn timer lvdelmeapg dvealappvr hliatqlsls
241 ledimrilak slpkgpftyi spsnteltlm iqergdknvt mgqssarmkl nwavaagaed
301 pgpavagils iqnmittllan aslnlhskkq aeleeiyess irgvqlrrls avnsiflshn
361 ntkelnspil fafshlessd geagrdppak dvmpgprqel lcawfksdsd rgghwatevc
421 qvlgsknst tcqcsllssf tilmahydv dwkltlitr glalslfc ll lciltflivr
481 piqgsrttih lhlclclfv stiflagien eggqvglrcr lvagllhyfc laafcwmsle

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541 glELYflVvr vfqggglstr wlcligygvp lliVgvsaai yskgygrpry cwldfeqqfl
601 wsflgpvtfi ilcnavifvt tvwkltqkfs einpdmkklk karaltitai aqlfllgctw
661 vfglfifddr slvltYvfti lnclqgaflY llhc1lnkkv reeyrkwacl vaggskysef
721 tsttsgtghn qtralrases gi
```

//

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Jun 8 2004 17:01:12



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☐ 1: P48960[gi:6226566] This record was replaced or removed. See [revision history](#) for details.

LOCUS P48960 835 aa linear PRI 15-DEC-1999

DEFINITION LEUCOCYTE ANTIGEN CD97 PRECURSOR.

ACCESSION P48960

VERSION P48960 GI:6226566

DBSOURCE swissprot: locus CD97\_HUMAN, accession P48960;  
class: standard.  
created: Feb 1, 1996.  
sequence updated: Dec 15, 1999.  
annotation updated: Dec 15, 1999.  
xrefs: gi: 840770, gi: 840771, gi: 1165073, gi: 4379069, gi: 1165084, gi: 1165085, gi: 1165086, gi: 2660552, gi: 2660553, gi: 1165087, gi: 4379070, gi: 1165089, gi: 1165090, gi: 1165091, gi: 1165075, gi: 1165076, gi: 1165077, gi: 1165078, gi: 1165079, gi: 1165080, gi: 1165081, gi: 1165082, gi: 1165083  
xrefs (non-sequence databases): HSSPP35555, GCRDBGCR\_1063, GCRDBGCR\_2113, GCRDBGCR\_2382, MIM 601211, PROSITEPS00649, PROSITEPS00650, PROSITEPS00010, PROSITEPS01187, PFAMPF00002

KEYWORDS G-protein coupled receptor; Transmembrane; Receptor; Glycoprotein; EGF-like domain; Repeat; Signal.

SOURCE Homo sapiens (human)

ORGANISM Homo sapiens  
Eukaryota; Metazoa; Chordata; Craniata; Vertebrata; Mammalia; Eutheria; Primates; Catarrhini; Hominidae; Homo.

REFERENCE 1 (residues 1 to 835)

AUTHORS Hamann,J., Eichler,W., Hamann,D., Kerstens,H.M., Poddighe,P.J., Hoovers,J.M., Hartmann,E., Strauss,M. and van Lier,R.A.

TITLE Expression cloning and chromosomal mapping of the leukocyte activation antigen CD97, a new seven-span transmembrane molecule of the secretion receptor superfamily with an unusual extracellular domain

JOURNAL J. Immunol. 155 (4), 1942-1950 (1995)

MEDLINE 95363161

REMARK SEQUENCE FROM N.A.

REFERENCE 2 (residues 1 to 835)

AUTHORS Hamann,J., Hartmann,E. and van Lier,R.A.

TITLE Structure of the human CD97 gene: exon shuffling has generated a new type of seven-span transmembrane molecule related to the secretin receptor superfamily

JOURNAL Genomics 32 (1), 144-147 (1996)

MEDLINE 96230339

REMARK SEQUENCE FROM N.A.  
TISSUE=FORESKIN

REFERENCE 3 (residues 1 to 835)

AUTHORS HAMANN,J.

TITLE Direct Submission

JOURNAL Submitted (~OCT-1997)

REMARK REVISIONS.

COMMENT On Nov 4, 1999 this sequence version replaced gi:1345711.

This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation - the European Bioinformatics Institute. The original entry is available from <http://www.expasy.ch/sprot> and <http://www.ebi.ac.uk/sprot>

-----  
 [FUNCTION] COULD BE A RECEPTOR POTENTIALLY INVOLVED IN BOTH ADHESION AND SIGNALING PROCESSES EARLY AFTER LEUKOCYTE ACTIVATION.  
 [SUBCELLULAR LOCATION] INTEGRAL MEMBRANE PROTEIN.  
 [SIMILARITY] CONTAINS 5 EGF-LIKE DOMAINS.  
 [SIMILARITY] BELONGS TO FAMILY 2 OF G-PROTEIN COUPLED RECEPTORS.  
 [DATABASE] NAME=PROW; NOTE=CD guide CD97 entry;  
 WWW= '<http://www.ncbi.nlm.nih.gov/prow/cd/cd97.htm>'.

FEATURES	Location/Qualifiers
source	1..835 /organism="Homo sapiens" /db_xref="taxon:9606"
gene	1..835 /gene="CD97"
<u>Protein</u>	1..835 /gene="CD97" /product="LEUCOCYTE ANTIGEN CD97 PRECURSOR"
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<u>Region</u>	21..835 /gene="CD97" /region_name="Mature chain" /note="LEUCOCYTE ANTIGEN CD97."
<u>Region</u>	21..552 /gene="CD97" /region_name="Domain" /note="EXTRACELLULAR (POTENTIAL)."
<u>Region</u>	22..63 /gene="CD97" /region_name="Domain" /note="EGF-LIKE 1."
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<u>Bond</u>	bond(30,42) /gene="CD97" /bond_type="disulfide" /note="BY SIMILARITY."
<u>Site</u>	33 /gene="CD97" /site_type="glycosylation" /note="POTENTIAL."
<u>Site</u>	38 /gene="CD97" /site_type="glycosylation" /note="POTENTIAL."
<u>Bond</u>	bond(44,62) /gene="CD97" /bond_type="disulfide" /note="BY SIMILARITY."
<u>Region</u>	64..115 /gene="CD97"



Bond /region\_name="Domain"  
/note="EGF-LIKE 2, CALCIUM-BINDING (POTENTIAL)."  
bond(68,82)  
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Bond bond(76,91)  
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Bond bond(93,114)  
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Site 108  
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Region 116..159  
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Bond bond(120,133)  
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Region 121..213  
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Bond bond(127,142)  
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Bond bond(144,158)  
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/note="BY SIMILARITY."

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Bond bond(164,177)  
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Bond bond(171,186)  
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Bond bond(188,207)  
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Site 406  
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Site 453  
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Site 520  
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Region 790..835  
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## ORIGIN

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1  mggrvflafc vwltpgaet qdsrgcarwc pqnsscvnat acrcnpgfss fseiittpte
61 tcddinecat pskvscgkfs dcwntegsyd cvcspgyepv sgaktfknes entcqdvddec
121 qqnprlcksy gtcvntlgsy tcqclpgfkf ipedpkvctd vnectsgqnp chssthclnn
181 vgsyqcrerp gwqpiqspn gpnntvcdev decssgqhqc dsstvcfntv gsyscrerp
241 wkprhgiynn qkdtvcemt fstwtpppgv hsqtlrffid kvqdlgrdsk tssaevtiqn
301 viklvdelme apgdvealap pvrhliatql lsnledimri laksplkgpf tyispsntel
361 tlmqergdk nvtmgqssar mklnwavaag aedpgpavag ilsinqmttl lanaslhlhs
421 kkqaeleeiy essirgvqlr rlsavnsifl shntkelns pilfafshle ssdgeagrdp
481 pakdvmpgpr qellcafwks dsdrghwat evcqvlgskn gsttcqcshl ssftilmahy
541 dvedwklkli trvglalslf clilciltfl lvrpiqgsrt tihlhlclcl fvgstiflag
601 ieneggqvgl rcrlvagllh ycflaafcwm sleglelyfl vrvvfqgggl strwlccligy
661 gvpllivgvs aaiyskgygr prycwldfeq gflwsflgpv tfiilcnavi fvtvkwkltq
721 kfseinpdmk klkkaralti taiaqlfllg ctwvfglfif ddrslvltvy ftilnclqga
781 flyllhclln kkvreeyrkwl aclvaggsky seftsttsgt ghnqtralra sesgi
```

//

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Jun 8 2004 17:01:12



## Align two sequences

Wed Jun 30 18:38:12 BST 2004

```

/usr/tmp/seq1.65400.sca : 742 aa
>September 24, 1999, 742 bases, E3080B0C checksum 742 aa vs.
>November 4; 1999, 835 bases, F87ED563 checksum. 835 aa
scoring matrix: , gap penalties: -12/-2
88.9% identity; Global alignment score: 4887

```

```

      10      20      30      40      50      60
/usr/t  MGGRVFLAFCVWLTLPGAETQDSRGCARWCPQNSSCVNATACRCNPGFSSFSEIITTPTE
      .....
Novemb  MGGRVFLAFCVWLTLPGAETQDSRGCARWCPQNSSCVNATACRCNPGFSSFSEIITTPTE
      10      20      30      40      50      60

```

```

      70      80      90     100     110     120
/usr/t  TCDDINECATPSKVSCKGFSDCWNTEGSYDCVCSPGYEPVSGAKTFKNESENTCQDVDEC
      .....
Novemb  TCDDINECATPSKVSCKGFSDCWNTEGSYDCVCSPGYEPVSGAKTFKNESENTCQDVDEC
      70      80      90     100     110     120

```

```

/usr/t  -----
Novemb  QQNPRLCKSYGTCVNTLGSYTCQLPGFKFIPEDPKVCTDVNECTSGQNPCHSSTHCLNN
      130      140      150      160      170      180

```

```

      130      140
/usr/t  -----SSGQHQCDSSTVCFNTVGSYSCRCRPG
      .....
Novemb  VGSYQCRRCRPGWQPIPGSPNGPNNTVCEDVDECSGQHQCDSSTVCFNTVGSYSCRCRPG
      190      200      210      220      230      240

```

```

      150      160      170      180      190      200
/usr/t  WKPRHGIPNNQKDTVCEDMTFSTWTTPPGVHSQTLRFFDKVQDLGRDSKTSSAEVTIQN
      .....
Novemb  WKPRHGIPNNQKDTVCEDMTFSTWTTPPGVHSQTLRFFDKVQDLGRDSKTSSAEVTIQN
      250      260      270      280      290      300

```

```

      210      220      230      240      250      260
/usr/t  VIKLVDELMEAPGDVEALAPPVRHLIATQLLSNLEDIMRILAKSLPKGPFTYISPSNTEL
      .....
Novemb  VIKLVDELMEAPGDVEALAPPVRHLIATQLLSNLEDIMRILAKSLPKGPFTYISPSNTEL
      310      320      330      340      350      360

```

```

      270      280      290      300      310      320
/usr/t  TLMIQERGDKNVTMGQSSARMKLNWAVAAGAEDPGPAVAGILSIQNMTTLLANASLNLHS
      .....
Novemb  TLMIQERGDKNVTMGQSSARMKLNWAVAAGAEDPGPAVAGILSIQNMTTLLANASLNLHS
      370      380      390      400      410      420

```

```

      330      340      350      360      370      380
/usr/t  KKQAELEEIYESSIRGVQLRRLSAVNSIFLSHNNTKELNSPILFAFSHLESSDGEAGRDP

```

```

.....
Novemb KKQAELEEIYESSIRGVQLRRLSAVNSIFLSHNNTKELNSPILFAFSHLESSDGEAGRDP
      430      440      450      460      470      480

      390      400      410      420      430      440
/usr/t  PAKDVMPGPRQELLCAFWKSDSDRGHWATEVCQVLGSKNGSTTCQCSHLSSFTILMAHY
.....
Novemb  PAKDVMPGPRQELLCAFWKSDSDRGHWATEVCQVLGSKNGSTTCQCSHLSSFTILMAHY
      490      500      510      520      530      540

      450      460      470      480      490      500
/usr/t  DVEDWKLTLITRVGLALSFLCILLCILTFLLVRPIQGSRTTIHLHLCICLFGVSTIFLAG
.....
Novemb  DVEDWKLTLITRVGLALSFLCILLCILTFLLVRPIQGSRTTIHLHLCICLFGVSTIFLAG
      550      560      570      580      590      600

      510      520      530      540      550      560
/usr/t  IENEGGQVGLRCLVAGLLHYCFLA AFCWMSLEGLELYFLVVRVFQGQGLSTRWLCLIGY
.....
Novemb  IENEGGQVGLRCLVAGLLHYCFLA AFCWMSLEGLELYFLVVRVFQGQGLSTRWLCLIGY
      610      620      630      640      650      660

      570      580      590      600      610      620
/usr/t  GVPLLIVGVSAAIYSKGYGRPRYCWLDFEQGFLWSFLGPVTFIILCNAVIFVTTVWKLQ
.....
Novemb  GVPLLIVGVSAAIYSKGYGRPRYCWLDFEQGFLWSFLGPVTFIILCNAVIFVTTVWKLQ
      670      680      690      700      710      720

      630      640      650      660      670      680
/usr/t  KFSEINPDMKKLKKARALTITAI AQLFLLGCTWVFGLFIFDDRSLVLTYYVFTILNCLQGA
.....
Novemb  KFSEINPDMKKLKKARALTITAI AQLFLLGCTWVFGLFIFDDRSLVLTYYVFTILNCLQGA
      730      740      750      760      770      780

      690      700      710      720      730      740
/usr/t  FLYLLHCLLNKKVREEYRKWACLVAGGSKYSEFTSTTSGTGHNQTRALRASESGI
.....
Novemb  FLYLLHCLLNKKVREEYRKWACLVAGGSKYSEFTSTTSGTGHNQTRALRASESGI
      790      800      810      820      830
```

Elapsed time: 0:00:00

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# Align two sequences



Align two DNA or protein sequences using Lipman and Pearson's Align program

Enter (type or paste) your first sequence here, replacing the word *title* (after the >) with the name of your sequence. If your sequence is an EMBL or GenBank sequence as it appears in the data base delete the whole of the top line.

```
>September 24, 1999
1 mggrvflafc vwltlpgaet qdsrgcarwc pqnsscvnat acrcnpgfss fseiittpte
   61 tcddinecat pskvscgkfs dcwntegsyd cvcspgyepv sgaktfknes
entcqdvddec
   121 ssgqhqc dss tvcfntvgsy scr crpgwkp rhgipnnqkd tvcedmtfst
wtpppgvhsq
   181 tlsrffdkvq dlgrdsktss aevtignvik lvdelmeapg dvealappvr
hliatqllsn
   241 ledimrilak slpkgpftyi spsnteltlm iqergdknvt mgqssarmkl
nwavaagaed
   301 pgpavagils iqnmittlan aslnlhskkq aeleeiyess irgvqlrrls
avnsiflshn
   361 ntkelns pil fafshlessd geagrppak dvmpgprqel lcafwkdsd
rgghwatevc
   421 qvlgskngst tcqcshlssf tilmahydve dwkltlitr glalslfc11
```

Enter (type or paste) your second sequence here, replacing the word *title* (after the >) with the name of your sequence. If your sequence is an EMBL or GenBank sequence as it appears in the data base delete the whole of the top line.

```
>November 4, 1999
1 mggrvflafc vwltlpgaet qdsrgcarwc pqnsscvnat acrcnpgfss fseiittpte
   61 tcddinecat pskvscgkfs dcwntegsyd cvcspgyepv sgaktfknes
entcqdvddec
   121 qqnprlcksy gtcvntlg sy tcqclpgfkf ipedpkvctd vnectsggnp
chssthclnn
   181 vgsyqcr crp gwqpipgspn gpnntvcedv decssgqhqc dsstvcfntv
gsyscr crpg
   241 wkprhigipnn qkdtvcedmt fstwtpppgv hsqtlrffd kvqdlgrdsk
tssaevtign
   301 viklvdelme apgdvealap pvrhliatql lsnledimri laks1pkgpf
tyispsntel
   361 tlm iqergdk nvtmgqssar mklnwavaag aedpgpavag ils iqnmittl
lanaslnlhs
   421 kkqaeleeiy essirgvqlr rlsavnsifl shntkelns pilfafshle
```

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Maintained by Ian Giles : last updated 13th November 1995